DOCUMENT RESUME

ED 095 222 TM 003 908

AUTHOR	Alvir, Howard P.
TITLE	Performance Tests: Their Conception, Elaboration, and Formulation. Second Edition.
INSTITUTION	Francophone International Learning Module Systems, Albany, N.Y.
PUB DATE	21 Feb 74
NOTE	48p.
EDRS PRICE	MF-$0.75 HC-$1.85 PLUS POSTAGE
DESCRIPTORS	Computer Oriented Programs; *Course Objectives; *Criterion Referenced Tests; Curriculum Design; *Item Banks; *Nursing; *Performance Tests; Systems Development; Test Construction; Vocational Education
IDENTIFIERS	CISNE; *Computerized Information System Nursing Educators

ABSTRACT

This document defines performance testing as the task of determining how well performance objectives are mastered by learners. Examples are provided for teachers who have to conduct performance testing with industrial standards. Stress is laid on communicating and exchanging materials with colleagues. A reporting form is included which shows how input material can be entered into a CISNE (computerized information system for nursing educators). This computerized curriculum package has implications for both state syllabi and for individual teachers. Examples are given of how this can be done from a technological point of view which applies behavioral objective and criterion-reference testing theory. Flowcharts are presented which sum up these operations of CISNE. Since CISNE can produce modules, examples are given of the various components of these modules. (Author)

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TITLE

PERFORMANCE TESTS:

Their Conception, Elaboration, and Formulation

AUTHOR

Howard P. Alvir

FIRST EDITION - 4/21/72

SECOND EDITION - 2/21/74

TM 003 908

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PERFORMANCE TESTS ---specify--- EVALUATION

in the Difficult Task of

Determining How Well Objectives Are Attained

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CONTENT ANALYSIS

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in the Difficult Task of

Determining How Well Objectives Are Attained

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REPORTING FORMAT : The Question with Many Possible Answers and Approximations

THE NEXT STEPS : Starting to Think in Terms of What a Computerized System Can Do That an Individual Teacher Can't

THEIR FORMULATION

CURRICULUM : State Syllabus? or a Tally of What Is Actually Taught in the Classrooms across One or More States!

THE SYSTEM : Tying It All Together : A Few Flowcharts Designed to Sketch out the Big Picture of Modules That Unify Educational Targets, Tests, and Technology

"What are we trying to do?"

"How well have we done it?"

E V A L U A T I O N

Determining How Well Objectives Are Attained

TO: Teachers Interested in Performance Testing

FROM: Howard P. Alvir

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Putting This Research to Work

What to Do

If you feel performance type of testing can improve your teaching and aid your students, feel free to get in touch with us at the above address.

For a limited number of teachers, it will be possible to set up an arrangement that will get valuable evaluation information into their hands.

What You Will Be Expected to Send

1--Performance and Behavioral Objectives

For each item, you want evaluated on this format, you will submit a performance objective on the enclosed format, reporting form. #8

2--Corresponding Test Items

For each objective, you will construct a corresponding test item. Those tests which combine several objectives and items into a single evaluative instrument will be given priority.

3--Test Data

For each student, you will provide the following information in tabular form:

- student number
- evaluation of each item (maximum of ten items per test); this will usually be in the form of quality points ranging from 0 to 9
- working time in minutes

For each batch, you will provide the following identification:

- instructor code
- school code
- job code
- maximum number of quality points
- T_2 - Time of industrial standard or experienced operator
- Q_2 - Industrial standard quality points or experienced operator

What You Will Receive From the System

- total quality points for each student
- average working time of the group
- results of Formula I for each student (peer group standard)
- results of Formula II for each student (industrial standard)
- results of Formula III for each student (industrial time standard for maximum quality work only)
- efficiency score (I, II, or III)
- trainee efficiency measured as percent of industrial standard
- average group time
- average efficiency score
- average trainee efficiency measurement as percent of industrial standard
- if a retest is desired, all the above is available plus the following comparisons (test/retest) for both individuals and group percent loss or gain by efficiency scores
  - percent loss of gain by industrial standards
  - statistical significance of loss or gain

More is Available

The question arises, "How did the above list of outputs develop?"

The answer is simple: Interested educators said they would like to have this type of information but it took too much time. Computer programs were then developed to meet this expressed need.

If you have questions or if there is other information you want out of this data, feel free to communicate with the Bureau of Occupational Education Research.

Wait until all is cleared before starting to send your data.

PERFORMANCE TESTING : Putting Research to Work
for the Classroom Teacher
Interested in Industrial Standards

Many teachers feel that a combination of performance objectives as a rough guide and industrial standards as a measuring rod creates a team that can improve the teaching-learning process.

The question arises, "How did such teamwork develop?"

The answer is simple : Interested educators said they would like to have information available to them providing peer group standards, industrial quality standards, and industrial time standards but it would take too much time for an individual teacher.

Computer programs were then set up to get this valuable evaluation information into the hands of educators. It is a two-way street : the teacher receives a helpful service and the researchers receive information from the resulting feedback that continually improvides the quality and the specificity of the service rendered.

What the Teacher Does

1-- Performance and Behavioral Objectives

For each item the teacher wants evaluated, he submits a performance objective in a format which includes:

- cross-referenced coding
- conditions, performance, and extent of the particular objective.

In actual practice, this includes the following previous activities:

- decisions about what is essential and what is incidential in the conception of a particular course on the local educational agency level
- selection of objectives from lists constructed and written by teachers giving similar courses
- writing and cross-referencing only that local objectives which are not available elsewhere through use of the computer feedback system.

2-- Cross-Referenced Test Items

For each objective, the teacher will construct a corresponding test item.

Those tests which combine several objectives and items into a single evaluative instrument would seem to be of high priority at this point.

In actual practice, this includes the following activities:

- going over old examinations, both paper-and-pencil and psychomotor, and deciding whether or not a particular item really gives the type of information needed by the school, teachers, and trainees
- if a particular item is valuable, then it must be related to an objective to establish its priority; otherwise, it is removed from consideration as a prime concern.
- often a clearly written performance objective will make the test item obvious or self-evident
- once test itmes have been cross-referenced with essential and incidental objectives, it will often be necessary to construct new test items to measure essential objectives that are not currently being adequately evaluated by existing testing instruments.

Goal: Management, Not Merely Enumeration

Rather than become bogged down in insurmountable paperwork, the teacher should realize that his task is to gain control of the educational situation.

At the moment of entering upon a feedback system, the prime consideration is not that every course have every possible terminal and enabling objective clearly written up in a file cabinet somewhere.

The important thing is that teachers begin to decide which objectives are really worth teaching and measuring. Rather than get swamped in details, it is suggested that teachers start with the most important objectives of their courses. Once these are taken care of, the teacher will be able in later work to spell out incidental learnings which are important but which are not as essential as the prime importance objectives which must be learned by every successful trainee and student.

A real feedback system will give the following capabilities to each participant:

- the ability to edit, adapt, and rewrite objectives to fit new needs and new conceptions
- the ability to profit from the successful and well written objectives and items of others
- the ability to revise one's own curriculum without having to choose objectives for which no support (clear statement, test items, and cross-referenced media) exists.

3-- Test Data

Once the participant has decided upon "his or her objectives," i.e., those objectives which have been personally written or chosen from the work of others, student and test data are necessary for a complete analysis.

For each student, the teacher will provid the following information in tabular for data processing form:

- student number (the complete computerized file is necessary only the first time)
- evaluation of each item (maximum of ten itmes per test); this will usually be in the form of quality points ranging from 0 to 9
- working time in minutes.

For each batch, the teacher will provide the following identification:

- instructor code
- school code
- job code
- maximum number of quality points
- T_i - Time of industrial standard or of experienced operator
- Q_i - Industrial standard quality points or of experienced operator

Service, Not Monolithic Similarity

The above procedures are for those educators interested in having data on peer, quality, and time standards in the correction of examinations.

Rather than appear as a prescription for all educational institutions, it is proposed as merely an example of the tailor-made options available.

System, Non Immutable Stability

The above procedures are for those educators who realize that their first efforts at writing objectives and cross-referenced test items will not always give immediate results of the hightest possible quality.

However, with a systematic approach, teachers and other educators will be able to update, edit, and revise both their objectives and test items.

This means that the system will try to set up the computerized hardware necessary to make this possible.

Structure, Not Unprocessed Data

The above procedures are designed to facilitate an intellectual audit of the widest possible scope.

Rather than say that the following courses are taught at a particular local educational agency, it will be possible to spell out with performance objectives exactly what is taught under a particular course name.

In time, it will be possible to spell this out in terms of entry level job skills.

What the Teacher Will Receive

For every objective and cross-reference test item submitted, the instructor could receive the following:

- total quality points for each studen
- average working time of the group
- results of Formula I for each student (peer group standard)
- results of Formula II for each student (industrial standard)
- results of Formula III for each student (industrial time standard for maximum quality work only)
- efficiency score (I, II, or III)
- trainee efficiency measured as percent of industrial standard
- average group time
- average efficiency score
- average trainee efficiency measureme as percent of industrial standard
- if a retest is desired, all the abov is available plus the following comparisons (test/retest) for both individuals and group percent loss or gain by efficiency scores
  - percent loss of gain by industria standards
  - statistical significance of loss or gain

Individual adaptations of the above are always available to respond better to local needs and goals.

ACCESSIBILITY

Finding Out What Other Educators Are Doing

THE FIRST STEP : How to Start Writing Performance Objectives

Whether or not there are a large number of teachers who have started writing performance objectives for their students is a question open to discussion.

Once one defines a performance objective as a formulation of an educational goal spelt out in terms of measurable performance as its criterion, it is obvious that thousands of teachers have done the necessary thinking and deciding to develop criterion-reference goals for their classroom activities.

Because much of this work has occurred without feedback from other teachers in similar courses, a great amount of educational planning has been done over and over again in a way that resembles the repetitious activities of Sisyphus.

The Working Force for This Project

At the present time, there are thousands of teachers who are spending long hours preparing their classes.

Whether these teachers realize it or not, all the work they do to develop interesting lesson plans, well thought out test questions, and practical teaching aids are really part of performance objectives.

They have done enough work to provide a sound basis for educational innovations. Only one thing is missing: they have not provided a method of recording, classifying, and evaluating all their work.

Because this work is repeated over and over again without feedback, it is much like a book misplaced in the library. For all practical purposes, it is lost.

The First Step - Write Only One Objective

In order to get teachers to start writing performance objectives, it is absolutely essential that they do not write too much.

The important thing is not to write hundreds of objectives for a particular course, but to write one or two carefully chosen objectives that stress principal goals of a particular teacher for a particular group of students.

It would be better for a teacher voluntarily to write in half an hour one performance objective which is clearly understandable than under duress to write hundreds of performance objectives which are more paperwork than practical teaching and learning guides; besides, all this needless writing would take too much time.

Format

Sooner or later, a group of teachers will want to develop a uniform format on which to record and write performance objectives. A later section gives one of many possible formats.

The format eventually chosen should reflect two things:

- local needs
- compatability with a feedback system.

Then Pass It Around for Comment

Once an objective has been written, it would be given to colleagues and to students.

Any difficulty they might experience in understanding precisely what he meant would force the teacher to get rid of vague words such as "know" and "understand." This right critical audience would force the teacher to express his objectives in concrete terms.

For example, if he knew he was going to rely on fill-in questions as his sole evaluative criteria, he would have to say that his observable and measurable goal was "the ability to recall from memory well enough to answer fill-in questions" instead of saying that he wanted his students "to really know" his subject matter.

Another example: if he claimed higher goals such as "creativity" or "deeper understanding," he would be forced to ask himself, "How am I going to measure these outcomes which cannot be ascertained from strictly recall questions?"

All of this would have to take place before the course began and not just before the final exam.

An Aid to Evaluation

A teacher is asked to write merely one performance objective, not to give him more paperwork, but to get him to ask concrete questions about exactly what he is expecting of himself and of his students in the classroom.

Once a teacher puts his objectives in terms that can be recognized by the average man on the street, he will find out two things:

- he will get suggestion after suggestion on how to improve either his goals or his methods or his evaluation techniques, and
- he will begin coming up with many improvements himself.

It's similar to a situation wherein one starts competing with oneself, it's hard to remain satisfied even with above average results.

This seems to be the motivation in golf where both pro and amateur keep getting better or worse because there is a very visible method of keeping score.

The Second Step - Correlate One Test Item with a Well Written Objective

Once a teacher has written one performance objective, he will know the difference between vague and precise terminology.

The next step would be for the teacher to take the best test question off his last examination and try to identify which objective is being measured by this test item.

After this has been done, he would ask his colleagues and students to tell him whether or not this item is measuring understanding or merely memory recall.

Professional Growth

It is a revealing experience for a teacher to struggle with the uncertainty that arise from a few simple questions:

- "Which course objective does this test item really measure?" or
- "How does one construct a way to measure the creative goals of this course?"

After a few hours alone with these questions, the teacher will realize that he needs feedback: he needs to know what other teachers of the same and similar courses are doing.

He will then be in a position to learn from them their secrets of success to share with them what he has learned from personal experience.

The Third Step - Start to Rate and Classify Objectives

Once the teacher understands the concrete terminology of performance objectives and how to relate them to test questions, he is ready to start choosing the most important objectives of his course.

These objectives need not necessarily be perfectly written and unalterable.

Even if imperfect, these objectives will allow the teacher to make comparisons and revisions.

Once his objectives are codified by subject matter, he will be able to compare his objectives with those of other teachers of the same material.

The Fourth Step - Tie Objectives and Tests, and Media Together into a System

Once he starts getting feedback from other teachers about their objectives, he will be able to use tools they have found successful. This would include:

- test items,
- evaluation instruments,
- instructional media,
- other techniques.

The Fifth Step - Start Using the Performance Objective Code Number

In the same manner, once a subject matter is divided into a carefully codified set of objectives, the teacher is able to apply the same code numbers to teaching aids and other educational brainware and hardware.

Thus, when the teacher has chosen a particular objective for his students, he will be able to obtain a number of helpful teaching tools:

- teaching aids,
- classroom projects,
- lesson plans,
- classroom activities,
- supplementary reading,
- testing, and
- evaluation instructions by means of one code number.

In the same way, with the same code number the student will be able to obtain similar learning

- individual assignments according to his ability and interest,
- projects developed especially for him,
- study guides designed with his ability and interest,
- projects developed especially for him,
- study guides designed with his abilities and strengths in mind,
- extra tutoring when and where it is necessary, and
- a profile of his marketable skills which achievement of a particular objective will give him.

The Sixth Step - Ongoing Activities

This section has stressed only a general overview of the first steps necessary to start writing performance objectives in a systematic way.

It takes a lot of time and work to make these initial extra efforts for the benefit of a system. The next section on the benefits of a carefully developed system will show a few of the long-range advantages of this extra care when a teacher begins writing.

REPORTING FORMAT : The Question With Many Possible Answers and Approximations

After all the theorizing and deciding is done in a school or in a department about to start writing performance objectives, one common question arises, "What uniform format will satisfy all of our needs?"

Typically these needs include various possible uses to which the objectives will be put : ease of writing, possibility of editing, reproduction either by copy machines or by computer print-out, coding for retrieval and cross-reference purposes, ability to be used for developing a tally and picture of the structure of what is actually taught in a particular area, built-in research and evaluation potentials, and demands of both teachers and students.

This makes a lot of decision necessary even before the first objectives is ready for writing or entry into the system.

DISPLAY

Form #9

EVALUATION SERVICE CENTER
FOR OCCUPATIONAL EDUCATION

Behavioral Objective Reporting Form

Code No. _____

Field of Study _____ State _____

Major Group _____ School _____

Sub Group _____ Instructor _____

Block _____ Facilitator _____

Unit _____ No. _____ Level _____

Instructional Time _____ No. Taking Obj. _____

School Year Written _____

Behavioral Objective

Condition(s) _____

_____

_____

_____

Performance _____

_____

_____

_____

_____

_____

_____

Extent _____

_____

_____

Direct Prerequisite Unit(s) _____

Direct Dependent Unit(s) _____

Exit Behavior (Check One) Yes [ ] No [ ]

All These Forms Begin to Look Alike

After reviewing a typical behavioral or performance objective reporting from, one can begin to think, "They're all pretty much alike."

Closer examination will show that this is true as far as conditions, performance, and extent are concerned. However, even such common elements as subject matter code show many possible variations both in code and in theory behind the code.

Don't Get Tied to Non-Essential Details

Form #9 is presented merely as an example of what one evaluation service center has done.

Each of the entries on this form was no doubt the subject of serious and prolonged discussion.

Going through the information it codifies will serve as a good introduction to the basic requirements of the typical reporting form.

An Item by Item Analysis

Code No.

This is a summary in numeric form of the following information which specified a number of things about the objective: field of study, major group, sub-group, block, unit, sub-unit number, instructional time, direct prerequisites, direct dependent units, exit behavior potential, capability classification, and related disciplines; also in the local writing domain: state, school instructor, facilitator, level, number taking objective, and school year written.

Field of Study

Major Group

Sub-Group

These refer to the first six digits of the USOE subject matter code.

Example: 17.0000 indicates the field of study (trades and industry).

17.0300 indicates the major group (automotive industries).

17.0302 indicates the sub-group (mechanics).

Block

Unit

Number

These refer to the 7th, 8th, 9th, 10th, 11th, and 12th digits added to the basic USOE code for subject matter.

Example: 17.03020400 could refer to engine; 17.03020600 could refer to brakes; 17.03020800 could refer to chassis.

Thus, each sub-group would be broken down into blocks (7th and 8th digits).

Similarly, each block would be broken down into units (9th and 10th digits).

Example: 17.03020406 could refer to six-cylinder engines; 17.03020408 could refer to eight-cylinder engines.

When necessary, further sub-divisions would be possible through the use of other numbers (11th and 12th digits).

CAPABILITY CLASSIFICATION

Psychomotor

[ ] Psychomotor (Check only if performance requires a significant amount of muscular activity).

Cognitive

(Check the one cognitive capability that best describes the mental activity involved).

Knowledge Acquisition

[ ] C1.1 Knowledge of Specifics

[ ] C1.2 Knowledge of Ways & Means of Dealing with Specifics

Knowledge Application

[ ] C2.1 Knowledge Application Without Alteration

[ ] C2.2 Knowledge Application With Alteration

Related Subject Discipline (Check those applicable)

MATHEMATICS

Elementary School Mathematics

[ ] Basic arithmetic & operations
[ ] Informal algebra
[ ] Informal geometry

Mathematics (7th & 8th grades)

[ ] Applied arithmetic
[ ] Geometry & measurement
[ ] Algebra, graphs, problem solving

Secondary School Mathematics

[ ] Algebra (first year)
[ ] Algebra (second year)
[ ] Algebra (third year)
[ ] Geometry
[ ] Trigonometry
[ ] Business Arithmetic
[ ] Consumer Mathematics
[ ] Shop Mathematics
[ ] Calculus
[ ] Computer Mathematics

OTHER
(Specify)

[ ] _____
[ ] _____
[ ] _____
[ ] _____

SCIENCE

[ ] General Science

Biology

[ ] General Biology
[ ] Anatomy
[ ] Bacteriology
[ ] Biochemistry
[ ] Ecology
[ ] Nutrition
[ ] Physiology

Chemistry

[ ] General Chemistry
[ ] Inorganic Chemistry
[ ] Qualitative Analysis
[ ] Quantitative Analysis
[ ] Materials Science

Physics

[ ] General Physics
[ ] Electricity & Magnetism
[ ] Electronics
[ ] Heat
[ ] Mechanics
[ ] Nuclear Science
[ ] Optics
[ ] Solid State Physics
[ ] Sound

State

School

Instructor

Facilitator

This information helps identify the source of the objectives (state, school which would include school district in its code, instructor who wrote, and facilitator who did the first editing).

Level

This code tries to answer a few simple questions:

- What is the level of the program?
  - pre-vocational
  - secondary
  - post-secondary
  - other
- How many years long is the program?
- At which year in the program is this objective offered?

Number Seeking Objective

This code tries to estimate how many students will be exposed to this objective from two viewpoints:

- How many students are enrolled in the course?
- How many students will probably be exposed to this objective? This latter case will be only an estimate in situations where production (number of jobs entering the school shop) is a prime consideration.

School Year Written

This information will be used for output concerning popularity and longevity of a particular objective.

The Heart of the Objective

Conditions

The circumstances under which the students are expected to perform constitute the conditions of an objective.

Conditions are expected to clarify such specifics as:

- Do students have access to standard tables and texts or to memory only?
- What tools must be used:
- Will trainees be tested under school quiet or industrial stress?

Each of these conditions obviously makes its own special demands upon the objective to be performed.

Performance

Performance means doing. The performance of an objective is what the student is expected to do.

- This performance must be measurable.
- One of the best ways to assure measurability is to insist on a observable and easily visible performance.
- That is why such indirectly observable activities as "know, understand, and comprehend" should be replaced with more visible verbs such as "change, repair, adjust, cut out and assemble."

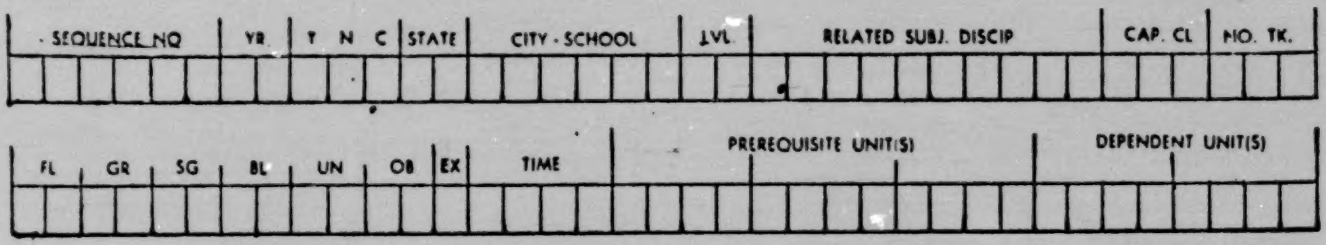
Extent

The minimum acceptable standard of achievement constitutes the extent or level of performance.

There will be an anticipated difference between the functioning of a master mechanic and the best student after a one-year course.

Certain jobs will require stress on a number of factors including quality, errors, tolerance, percentages, and time. All of these must be spelled out as the criteria on which the performance will be judged successful or unsuccessful.

DISPLAY: CODING LABEL



Once a coding system has been decided upon, it is possible to simplify the classification information by numeric codes. The following information can be inserted into the above tape :

Sequence Number -- a temporary number used to keep track of input before keypunching

Year -- the year the objective was written

Type -- objective, test item, or media

Number -- first card, second card, third card

Continuation -- double check for second and third cards

State

City

School

Level

Related Subject Discipline

Capacity Classification

Number Taking Objective

Field

Group

Subgroup

Block

Unit

Objective

Exit Level

Time

Prerequisite Unit(s)

Dependent Unit(s)

Direct Prerequisite Unit(s)

This is the answer to the question:

- Which objective or objectives must be successfully completed before attempting this new unit objective?

Direct Dependent Unit(s)

This is the answer to the question:

- Which objective or objectives should sequentially follow the successful completion of this unit objective?

Exit Behavior

This is the answer to the question:

- Does successful completion of this objective give the trainee a marketable skill for entry level employment?

Capability Classification

This section is a check-list in three areas: psychomotor, cognitive, and related subjects.

Psychomotor

This is an attempt to answer the question:

- Does the accomplishment of this objective involve a significant amount of muscular activity?

Cognitive

This is an attempt to answer the question:

- Does this objective stress acquisition or application of knowledge?
- In other words, is this objective based more heavily upon memory or upon higher mental functions in its cognitive component?

Related Subject Discipline

This is an attempt to answer the question:

- Where does this objective tie into basic education as far as math or science is concerned?

Hindsight

The careful reader of the above description of the typical behavioral or performance objective reporting form will notice two missing items:

- there is no place on the reporting form to prescribe how the objective in question is to be taught
- there is no place on the reporting form to prescribe how the objective in question is to be measured.

The reasons are simple:

- Rather than specify specific means, method, or procedures, a performance objective leaves open a number of paths to its accomplishment
- Rather than specify specific test items to be used to measure an objective, a performance makes it crystal clear by its conditions, performance, and extent exactly what is to be measured.
- The emphasis is not on a particular thermometer test item which may or may not always function correctly but on the standard of excellence expected of the successful trainee.
- Once excellence has been defined in clear cut terms, it should be much easier to achieve and recognize.

THE NEXT STEPS : Starting to Think in Terms of What a Computerized System Can Do That an Individual Teacher Can't

It is almost axiomatic that teachers have dreamed dreams that other teachers have fulfilled in later centuries or in later generations.

With the aid of modern and existing computer technology, the modern teacher can see a portion of his dream come true in his own lifetime if not in a year or two.

Going onto an automatic data processing or computerized system will not work miracles, but it will save hours, days, weeks, and even months of routine clerical tasks that must be done to achieve the kind of feedback that answers the simple question, "Did my teaching accomplish what I set out to do?"

DESISIONS TO MAKE

COMPUTER REQUIREMENTS

Here is an outline summary of things to be done to computerize the evaluation service center.

(a) Objectives Onto Tape

-- format of printout
- Code
- Condition
- Performance
- Extent

-- ability to edit content -- proofread and revise content

-- ability to add other classifiers

-- Ammerson Melching
-- others needed

-- restructure USOE and content codes

(b) Cross-reference of Test Items

-- Code

-- Different forms of same test

-- Levels of difficulty

-- Alternate forms

(c) Immediate Statistics

-- Time Standards Option
(Formulas I, II, III)

-- Test Correction Option

-- Profiles Individual, Class, Teacher, Course Program, School District, State

(d) Item Analysis (Exactly What Will Be Analyzed)

DISPLAY

Decisions to Make

In some ways, the transition from dreams to reality comes naturally and when one starts to make decisions.

There are many areas to think over, each of which requires an amount of specificity that takes time to achieve:

- how to get the first versions of the performance objectives onto computer-readable format
- how to cross-reference the test items and other media support in a way that will facilitate both entry and retrieval in a variety of formats
- how to articulate the entire system in such a way as to provide immediately necessary statistics and long-range information needs
- how to decide the type of item analysis required by the local educational agency and consistent with its budgetary limitations
- how to decide which student characteristics are necessary for later research and correlation studies to determine differential effects of various objectives
- how to decide on which ongoing activities will receive priority or long-range status.

Each one of these decisions must be broken down into a number of specifics.

The following sections will look at each of them in turn.

From Paper-and-Pencil to Computer-Readable

Consideration must be given to two types of format:

- the format filled out by participatin teachers, educators, and all other sources of objectives
- the format of the computer print-out which must be mass-distributed and frequently referred to in the editing and selection process

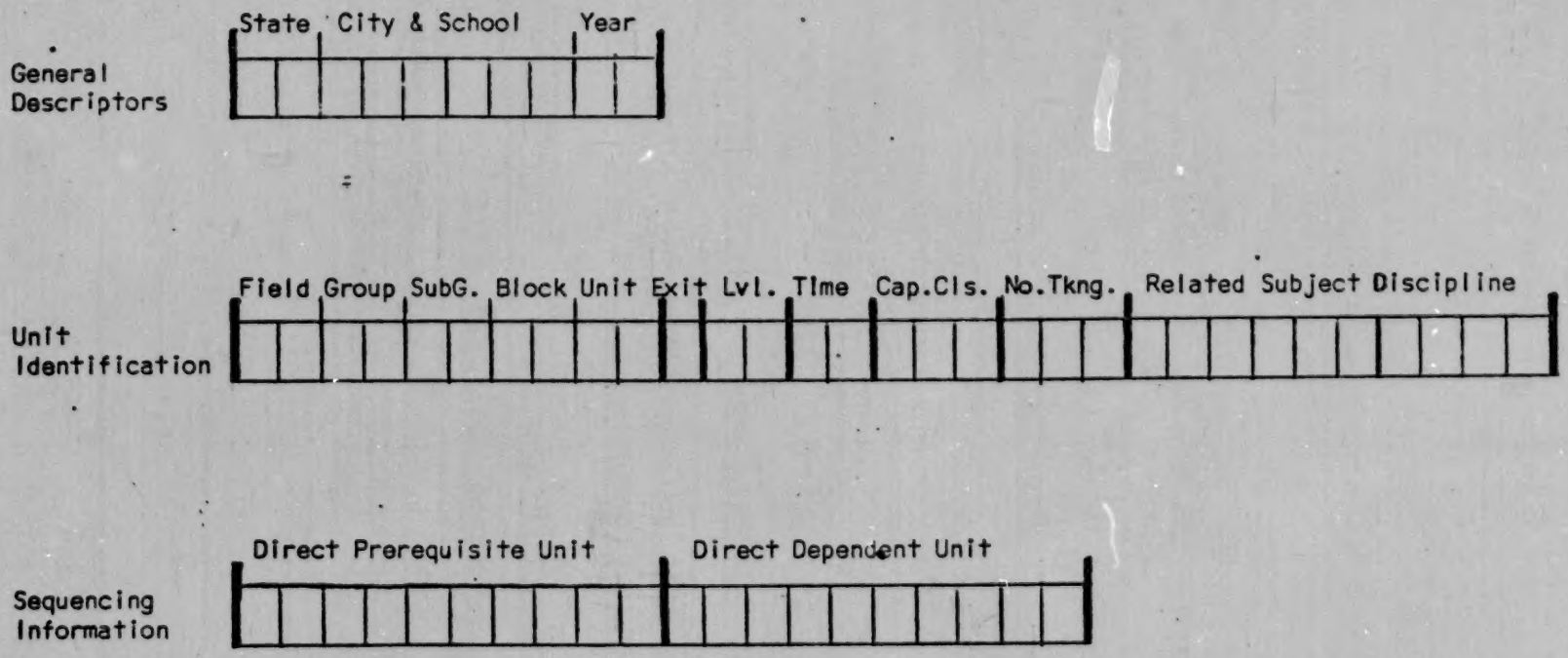
This will facilitate a number of things necessary to keep the item and objective bank active and up-to-date:

- editing (major changes)
- revisions (minor changes)
- additions (new entries)
- updating (constant renewal)
- broadening (humanistic goals).

Software Considerations

Some questions will be on a rather mundane level:

- Should we use straight keypunching or a combination of other methods to enter corrected data?
- Should this be done by physically transporting the objectives or by a computer terminal and a long-distance phone call?
- How can cost and system requirements be optimally balanced?
- How much confidence can we place in students, teachers, and administrators who will provide the balk of the input data? Must they be constantly supervised every step of the way?



Proposed Code Number Structure

D I S P L A Y

Basic Cross-Reference Categories

Despite individual school needs, most local educational agencies will find it convenient to employ three general areas of cross-reference:

- short-range general descriptors
- subject matter classifiers
- long-range sequencing indices

Verbal or Numeric Descriptors

Verbal descriptors refer to words or abbreviations employing the normal alphabet.

Numeric descriptors are a combination of numbers, letters, and symbols which are not usually derived from everyday language.

As a practical norm, it is safe to say that both will be used by most coded cross-reference systems:

- verbal descriptors will be used by teachers and supervisors as they write objectives
- numeric descriptors will be used by editors and systems specialists who prepare the objectives and items for entry into computer-readable format

Illustration (Refer to Sample on Left)

Rather than devote unnecessary computer memory core to names of states, schools, and fields of curriculum, all these areas will be covered by appropriate numeric codes which can be entered into code number structures such as that illustrated on the left.

Examples: Typical General Descriptors

These would include such things as:

- state
- city
- school
- year objective was written
- teacher or teachers who write it

Subject Matter

Examples: Identification

Subject matter or teaching unit identification would be based upon such things as the USOE code:

- field (1st two digits; e.g. 17.0000 would indicate Trades and Industry)
- group (3rd and 4th digits; e.g. 17.0300 would indicate Automotive Industries)
- subgroup (5th and 6th digits; e.g. 17.0301 would indicate Body and Fender)
- block (7th and 8th digits; e.g. 17.03010300 could indicate Body Repair)
- unit (9th and 10th digits; e.g. 17.03010307 could indicate estimating costs)

There are also other considerations:

- exit (whether or not entry level job skill)
- level (type and level where offered in school program)
- time (amount of instructional time envisioned to teach objective)
- capability classification (cognitive, affective, or psychomotor domain)
- number taking objective (how many students seeking this goal)
- related subject discipline (related natural science or math background)

Examples: Sequential Information

This is an attempt to determine two things:

- direct prerequisite units or objectives necessary
- direct dependent or sequential objectives after present goal

This will help determine which elements of the curriculum follow each other from two points of view:

- what is actually taught in a particular order by teachers
- what is actually learned in terms of student acheivement over a period of time
- which goals must be achieved to succeed on a particular objective
- which goals are appropriate for a student who completes a sequence before, with, or after the majority of other students

Cross-Referencing Is Never Left Unrevised

The constant necessity to cross-reference and to retrive information on a variety of variables demands the ability to add other classifiers as the need might arise.

- This could occur when a new break-through occurs in developing a successful classification system by a team of basic researchers.
- This could occur when another bank of objectives is placed en masse into an existing classification.

Such codes as the USOE system (six digits) will undoubtedly be used in the initial input. When such codes are found inadequate in their seventh to tenth digits, it will be necessary to change the affected code digits. For the first time, data will be available with which to make these necessary corrections.

Immediate Statistical Needs

These needs can assume a variety of forms.

When a teacher starts working in the area of performance, he or she will find that certain theoretical bases of trainee success will assume different forms:

- the normal distribution curve will not always be appropriate for measuring the success of students on objectives which every student is expected to achieve 100 per cent
- a distribution of learning times is to be expected; this will give rise to the following situations:
  - teachers will need additional later skill objectives or additional higher skills to correspond with variations in trainee learning time
  - if learning time remains a constant, then each objective will have to have a number of levels of accomplishment from basic minimum to more advanced skills

Rather than rely upon traditional pretest and post-test measurements, the accomplishment of performance objectives requires the stress upon growth or gains rather than relative position on a normal curve:

- the measurement of gains will be difficult from a normal pretest situation since it could be physically dangerous to pretest trainees on certain heavy equipment
- the actuarial measurement of gains would also be necessary since not all trainees would be expected to grow or change at the same rate
- the measurement of gains will probably center upon periods of time within the structure of a course; e.g. tests will be given when a trainee is safely able to operate a machine on his own as a quasi-pretest to be compared with a post-test measuring the effect of additional instruction

ITEM ANALYSIS

- The evaluation service center will develop a number of Objectives classified on a variety of categories.

- Each objective will have a unique identifier:
  This will be a code number which includes among other things:
  - USOE code number (subject matter)
  - domain (cognitive, affective psychomotor)
  - other cross-identifiers and cross-classifiers

- After the first year of testing, each objective will have corresponding test items with coded cross-references based on a number of things with the ability to make the items more individualized and more accessible :
  - level of difficulty
  - predictability on next sequencial objective
  - Guttman Scale
  - success group correlated (with student characteristics)
  - gains scores
  - list of entry level occupational skills per child

SUMMARY

One Unit:

Code	Objective-Item	Statistics	Media	Prescriptions	etc.

DISPLAY

Examples of Possible Statistical Services

The limits of the human imagination seem to the principal limitations of the statistical possibilities of computerized data services.

Here are a few of the many service packages that come to mind:

- time standards option whereby the teacher could receive pretest and post-test information in three different configurations:
  - i • peer group standards for quality and time
  - ii • industrial standard for quality and time
  - iii • industrial time standard for maximum quality only
- test correction option whereby the teacher could submit the answer cards or sheets of the students via an on-line computer telephone terminal and receive the results a few minutes later through the same terminal
- student profile options are available for a number of things such as attendance reports, student report cards, automatically updated student records and transcripts, as well as profiles of progress along such dimensions as:
  - individual student
  - class average
  - teacher load
  - course program
  - individual school
  - department
  - school district
  - State

Item Analysis

Once each objective is coded, it will be possible to develop cross-references with such variables as:

- level (level of difficulty, level of previous training, level where the objective will be offered in school program)
- predictability (trying to find where future successes are highly probable as a result of success on a given objective)
- Guttman Scale (one of the many attempts to scale items with a corresponding level of skill)
- Success group correlation (trying to find out which groups or which student characteristics are highly correlated with success on particular items)
- gains scores (trying to develop actuarial tables along a variety of cross-referenced student and program variables)
- entry level occupational skills (trying to establish interfacing of classroom objectives with such things as computerized Job Banks and inventories of marketable skills)

Item analysis is not an end in itself, but it is a good instrument of action once a local educational agency has decided what to do with all the decision making data it has collected.

DISPLAY

STUDENT RECORD VARIABLES

Each student will have a unique identifier based upon:

- State
- School District
- School
- Date of birth
- Social security number
- Intellectual ability
  - I.Q.
  - Class rank
  - Other test scores ---- indicates areas to be further analyzed.
- Physical condition
  - Good health
  - Handicapped
  - Attendance record
- Socio-economic
  - Family
  - Parents
  - Siblings
  - Disadvantaged
  - Minority group membership
  - Career goals: 1. undecided 2. definite
  - Drop-out potential
- Learning record
  - Class rank decile
  - Track in school
  - Disciplinary
  - High school grades
  - High school grade point average
- Occupational record
  - Field
  - Time in field
  - Grades in field ---- grade average in occupational area
  - Number of courses
  - Part-time job
    - Related to field
    - Non-related

SUMMARY
One Unit:

Student I.D.	Background	Performance

Student Records

At the present time, there are a number of automatic data processing services that provide attendance reports, student records and transcripts by the simple act of pressing a computer button.

Each of these services is justified on its own merits.

The idea of this section is to suggest trying such existing information units together into a compatible system.

Why Bother to Develop Such a Complication

An example easily comes to mind. The Vocational Education Act of 1963 was aware of the needs of students with academic and socioeconomic handicaps. The 1968 Amendments made the disadvantaged a top priority item by requiring that 15% of the basic Federal allotment be used for them.

There are many ways to identify the disadvantaged; not all of them are satisfactory but here are a few of them:

- academic disadvantage
  - mental ability (I.Q.)
  - lack of school success (doing poorly or failing)
  - dissatisfaction with school
  - irregular attendance
- socio-economic disadvantage
  - poverty
  - occupation of parents
  - disadvantaged neighborhood
- cultural disadvantage
  - family size
  - migration
  - parents' education
  - marital status of parents
  - minority group membership
  - neglect
  - linguistic isolation
- other disadvantages
  - physical
  - emotional
  - delinquency

It is obvious, when one considers such factors as minority group membership and parents' education, that such potential sources of disadvantage do not always irreparably harm each individual even though they may work against some.

The Practical Concern Here

The point under discussion when one tries to define disadvantaged in concrete terms is not whether or not a particular item or a combination of tiems is an adequate definition.

The more general area of concern is this:

- Can objectives be analyzed in such a way that various student characteristics will be found correlated with success on these objectives?

- Can all of this be economically done by means of computerized data systems that will merge as needed files on test data and student records that have up to the present been kept separate?

Looking Ahead - Ongoing Activities

Once a teacher starts using a system of performance objectives, related test items, and other cross-referenced educational support tools, he soons finds out that he wants more.

Specifically, these usual demands touch the following general areas:

OBJECTIVES

- revisions (minor changes in words, contents, and nuances)
- editing (major changes in ideas, conditions, performances, and extent, and objective specificity)
- additions (adding more objectives to fill in missing areas in subject matter and curriculum)
- updating (replacing outdated objectives as the state of the world of labor demands newer techniques or newer procedures for entry level employment)
- broadening (adding more objectives to fill in necessary training goals by due attention to a balance of cognitive, affective, and psychomotor goals needed by trainees)

TEST ITEMS

- more test items (alternatives and new approaches to avoid the temptation to teaching to the "same old examination"
- item analysis (replacement of defective items and development of basic statistics on such things as level of difficulty or discrimination)

CURRICULUM

- auditing (finding out what is actually taught under the same course names across one of several states)
- structuring (establishing the order of objectives based upon research on differential student achievement)

INDIVIDUALIZATION OF INSTRUCTION

- assessment (giving a student or trainee an idea of where he is in terms of objectives accomplished in relation to entry level skills, to starting salary, and to style of learning)
- direction (giving a student or trainee some specific idea of what he can do next with great probability of success and of where this will lead him)
- tailor-made objectives (showing a student where people with his type of achievement and personal traits have succeeded)

CURRICULUM : State Syllabus ?
or a Tally of What Is Actually Taught
in the Classrooms across One or More States !

On the level of existing printed syllabus, there is little doubt about what is being taught across a state. Fields of study are broken down into major groups, minor groups, and blocks. On the local level, these blocks are broken down into courses, units, and day-by-day classroom instruction.

Because the generality of the state syllabus is designed for a wide audience and because the specificity of the local implementation is adapted to a more specialized clientele and job market, it is no great surprise to find a different point of view when tallies of performance objectives are compared with state curriculum guides.

THE PRECISE NATURE OF A STATEWIDE SYLLABUS

A Delineation of Both Its Strengths and Limitations for Occupational Education

A state syllabus or a statewide curriculum guide is a multi-faceted tool:

- Often, it is the result of a committee of the most prominent teachers chosen across a state.
- This means that much of the committee time must be spent defending local interests and making sure they are represented in the final document.
- Limitations of time and printing budget mean that certain local programs that could be successful in half a dozen or more other similar communities must be left out because they will not fit into the patterns of thirty or forty more typical situations.
- Since the same objectives must be made to work in a school which offers fifty or more occupational programs and in a school which specializes only in one, there will be a certain amount of anticipated abstraction which must be adapted by local educational agencies.
- When educational leaders get together to put out a curriculum guide, it can be assumed that it will incorporate the latest advances available at the time of writing.
- One disadvantage of this approach: States of technology will not sit still until the next curriculum revision.
- Another disadvantage: "Me-too" schools which lay out a lot of money for a 1970 shop in 1971 will be little inclined to spend more money to install a 1972 version until the 1973 version is recommended in the 1975 revision of the curriculum guide; the time-lag gap still persists.

THE WORK LOAD OF THE CLASSROOM TEACHER

There Is Only So Much One Person Can Do No Matter How Important the Priority Is

The classroom teacher has no shortage of things he must do:

- he must be in the school from eight until four; his so-called free periods can be eaten up by:
  - prefetting assignments
  - papers to correct
  - noise in the school
  - administrative paperwork
  - a variety of stressful priorities
- he must be with students twenty-five periods or more a week
  - this requires his full attention while in the classroom each day
  - this requires adequate lesson planning before coming to class

Confrontation with the State Curriculum

There are a number of ways in which the classroom teacher can be given additional work because of the State syllabus:

- his students must pass exams based upon common objectives
- his lesson plans must be written in such a way as to make obvious how they implement the curriculum
- his supervisor is often more familiar with state demands and criteria than with the objectives chosen or derived by the individual classroom teacher himself
- his colleagues will sometimes tell him, "Even if it's out-dated, teach it since it will be in the final exam or on the inspection report."

Such a framework is the opposite of the one herein proposed. This proposed structure is intended to shift the teacher's role from that of spectator to that of participant.

Where Do All These Difficulties Come From?

Rather than go around suspecting the motivation of curriculum writers on the State or the local level, it might be a good idea to admit a very well known but unpublicized fact:

- Because of the format of educational objectives, it is virtually impossible at the present time to obtain data which will show how the State curriculum is implemented on the local level.

- This results in at least three specific information lacks:

  - A tally of exactly what portions of a State curriculum are implemented in classroom objectives.

  - A tally of local options that have been proven successful and practical even though not mentioned in the official guides.

  - An estimate, based upon the results of actual classroom performance objective testing, of what per cent of either statewide or local objectives attempted are actually learned by students and trainees in occupational programs.

- Because the labor market must identify products of occupational education by documentation (e.g. high school diplomas, certificates, A.A. degrees, and other licenses) which reflects merely statewide objectives and not local options, it is not always easy to compare educational output with job demands.

Trying to Track Down Answers

Basically, this points to a preliminary question that must be answered:

- How do local schools continue the classification of subject matter beyond the USOE categories of Field of Study, Major Group, and Sub-Group?

Note: USOE Codes

For those readers not familiar with the USOE classification into field of study (e.g., 17.0000 refers to Trades and Industry), major group (e.g., 17.0100 refers to Air-Conditioning), and sub-group (e.g., 17.0101 refers to Cooling), the next three pages have been included to familiarize themselves with the overall coding scheme for occupational education.

The Next Step

Once this information has been obtained, it will become obvious that certain blocks are mentioned by a number of schools. This lead to two distinct questions:

- Which blocks are mentioned by a vast majority of schools as being typical components of its courses under a given USOE code?

- Which blocks are mentioned only by one school or only by a few schools?

OFFICE OF EDUCATION CODES

AGRICULTURE
(01.0000)

01.0100 Agricultural Production
01.0200 Agricultural Supplies
County Agent-Farm Insurance Adjuster
01.0300 Agricultural Mechanics
01.0400 Agricultural Products
01.0500 Ornamental Horticulture
01.0600 Agricultural Resources
01.0700 Forestry
01.9900 Other Agricultural (Specify)
Teacher-Farm Exam Officer

DISTRIBUTION & MARKETING
(04.0000)

04.0000 Marketing (General)
04.0500 Floristry - Horticultural Merchandizing
04.0600 Food Distribution
04.0800 General Merchandize Management (Gen./Mis)
Mid Management
04.2000 Retailing (Gen./Mis.) N.E.C.
Fashion Retailing
04.9900 Other Instructional Programs (Specify)

HEALTH OCCUPATIONS
(07.0000)

07.0100 Dental Services
07.0101 Dental Asst.
07.0103 Dental Lab. Tech.
07.0199 Dental, Other
07.0200 Medical Services
07.0203 Medical Lab. Asst.
07.0299 Medical Services (Other)
07.0300 Nursing
07.0302 Practical (Voc.) Nursing
07.0399 Nursing (Other)

HOME ECONOMICS

09.0100 Homemaking - Preparation for Personal, Home and Family Living
09.0101 Comprehensive Homemaking or Home Economics
09.1002 Child Development
09.0103 Clothing and Textiles
09.0104 Consumer Education
09.0105 Family Health
09.0106 Family Relations
09.0107 Foods and Nutrition
09.0108 Home Management
09.0109 Housing and Home Furnishing
09.0199 Other Homemaking (Specify)

09.0200 Occupational Preparation
- 09.0201 Care and Guidance of Children
- 09.0202 Clothing Management, Production & Services
- 09.0203 Food Management, Production & Services
- 09.0204 Home Furnishings, Equipment & Services
- 09.0205 Institutional and Home Management & Supporting Services
- 09.0299 Other Occupational Preparation (Specify)

OFFICE OCCUPATIONS
(14.0000)

14.0100 Accounting & Computing
14.0200 Business Data Processing Systems
14.0300 Filing, Office Machines, Gen. Office Clerical and Typing
14.0700 Stenographic, Secretarial and Related
14.9900 Other (Specify)

TECHNICAL

16.0100 Engineering Related Tech.
- 16.0102 Agricultural Tech.
- 16.0103 Architectural Tech. (Building Construction)
- 16.0106 Civil Tech.
- 16.0107 Electrical Tech.
- 16.0108 Electronics Tech.
- 16.0109 Electro-Mechanical Tech.
- 16.0111 Industrial Tech.
- 16.0112 Instrumentation Tech.
- 16.0113 Mechanical Tech.
- 16.0114 Metallurgical Tech.
- 16.0117 Scientific Data Processing-
- 16.0199 Other Related - Optics Tech., Welding Tech.

TRADES & INDUSTRY
(17.0000)

17.0100 Air Conditioning
- 17.0101 Cooling
- 17.0102 Heating
- 17.0103 Ventilating (filtering & humidification)
- 17.0199 Other Air Conditioning

17.0200 Appliance Repair
- 17.0201 Electrical Appliance

17.0300 Automotive Industries
- 17.0301 Body & Fender
- 17.0302 Mechanics
- 17.0399 Other Automotive Industries (Specify)

17.0700 Commercial Art Occ.
- 17.0701 Interior Decorating
- 17.0702 Window Display
- 17.0703 Product Design
- 17.0799 Commercial Art Occ. - Other

17.1000 Construction & Maintenance Trades
- 17.1001 Carpentry
- 17.1002 Electricity
- 17.1005 Painting & Decorating
- 17.1007 Plumbing & Pipefitting
- 17.1099 Construction & Maintenance - Other

17.1300 Drafting Occupation

17.1400 Electrical Occupations
- 17.1401 Industrial Electrician
- 17.1499 Other Electrical Occ.

17.1500 Electronics Occ.
- 17.1501 Communications
- 17.1502 Industrial
- 17.1599 Other Electronics Occ. (Specify)

17.1900 Graphic Arts Occ.
- 17.1901 Composition, Makeup & Typesetting
- 17.1902 Printing Press Occ.
- 17.1903 Lithography, Photography & Platemaking
- 17.1904 Photoengraving
- 17.1905 Silk Screening Making & Printing
- 17.1999 Graphic Arts - Other Offset

17.2300 Metalworking Occ.
- 17.2302 Machine Shop
- 17.2303 Machine Tool Operation
- 17.2305 Sheet Metal
- 17.2306 Welding & Cutting
- 17.2399 Other Metalworking Occ. (Specify)
  - Precision Sheet Metal
  - Metal Fabrication

17.2600 Personal Services
- 17.2602 Cosmetology
- 17.2699 Other Personal Services (Specify)

17.2800 Public Service
- 17.2801 Fireman Training
- 17.2899 Other Public Services (Specify)

17.2900 Quantity Food Occ.
- 17.2901 Baker
- 17.2902 Cook/Chef
- 17.2904 Waiter/Waitress
- 17.2999 Quantity Food Occ. - Other

17.3100 Small Engine Repair (Internal Combustion)

17.3300 Textile Production & Fabrication
- 17.3301 Dressmaking
- 17.3399 Other Textile Production & Fabrication - (Specify)

17.3400 Leatherworking
- 17.3401 Shoe Manufacturing
- 17.3402 Shoe Repair

17.3600 Woodworking Occ.
- 17.3601 Millwork & Cabinet-making
- 17.3699 Other Woodworking Occ. (Specify)

Patternmaking

House Carpentry

TALLY SHEETS

Putting the Answers to These Questions

to Work in Occupational Education

Planning and Awareness On a Statewide Basis

Results of Surveying Nine Schools

Each school was asked to break down its major blocks under the USOE code of 17.0302:

- 17.0000 -- Trades and Industry
- 17.0300 -- Automotive Industries
- 17.0302 -- Mechanics

It is to be remembered that by definition a block is a further subdivision of the USOE code to the 7th and 8th digit.

It must also be remembered that, as of 1971, no official coding system exists for the 7th and 8th digits even though each state uses its own coding system for internal reporting or for reporting to USOE.

The same constraints must be applied to all tentative attempts to specify exactly what is meant by the 9th and 10th digits which extend blocks into units of proposed classifying systems.

The problem of local retrieval adds another dimension to the problem. Since each school has its own course numbers, these might well be considered as identifiers which would have an immense local acception and practical value by expressing the system in terms and formats already in local use.

Here are the results expressed in blocks taught and in frequency of schools teaching a particular block.

Block	Frequency
Engine	8
Electrical	8
Brakes	6
Drive (Power) Train	6
Chassis	5
Cooling	4
Body	3
Suspension	3
Lubrication	3
Tune-up	3
Steering	2
Carburetion	2
Exhaust Service	2
STP Transmission Service	2
Special Needs	2
Rear Axle Service	2
Air-Conditioning	2
Alignment	1
Alternators	1
Generators	1
Electrical Motors	1
Tire Service	1
Accessories	1
Transmission Service	1
Shop Orientation	1
Engine Overhaul	1
Testing/Measuring	1

The above data is merely illustory and is not intended to be definitive. It is based on a small sample, nine schools only.

The above data is merely illustratory and is not intended to be definitive. It is based on a small sample of only nine schools. Casual inspection of its contents is all that is needed for the purpose it serves in this section. It does show that a tally of actual course blocks is a simple statistical concept.

ANALYSIS

This Survey Is

Not Proposed as a Model of Data

But as a Model of Decision-Making

Such a rapid survey will undoubtedly suffer from many sources of error:

- a sample size of nine schools is large enough for only a hasty overview
- not all possibilities will be represented in such a limited sampling
- it was intended to provoke discussion and inquiry rather than provide definitive data

Here are a few of the many activities that resulted from it:

- It became obvious that only five areas (engine, electrical, brakes, drive train, chassis) would provide a great deal of feedback in comparing and contrasting program objectives.
- Thus, rather than spend a lot of time subdividing such areas as tire service and accessories taught only by one school, it was decided to concentrate on the areas with the greatest amount of possible feedback.
- Similarly, schools which had only a few areas began to ask themselves why a particular area was not part of their approach.
- This didn't mean that all schools would adopt uniform programs, but it did mean that local options were chosen by teachers fully aware of other local options quite different in scope and conception.

Tying Data to Decisions

Once the data on classroom objectives was in manageable form, it was natural for a lot of questions to be asked and for a lot of comparisons to be made:

- Some began to ask why engine and tune-up were considered to be different blocks and not part of each other?
- Some asked why there was an apparent difference between such things as chassis and body? between STP transmission and transmission service? between colling and air-conditioning? between electrical and alternators and generators?
- After a while, the questions shifted from terminology and classification to the more fundamental question:
  - Exactly what is taught in a particular school under each of these blocks?
  - In other words, how does your school break down its blocks into units?

Going Beyond Terminology and Provicialism

Each state and each school has its own terminology and its own hierarchy of course objectives.

One advantage of such a tally as that examined above is that it allows good teachers, even when from different states, to start working together.

Note:

Such a survey will require additional rigor and design to make it a source of actual block structure.

However, it is proposed here merely as a vehicle to initiate the kind of thinking that must precede sending out the survey instruments.

SKILLS AND ABILITY PATTERNS REQUIRED IN THE MARKET PLACE

Making Sure That a Local Education Agency Doing a Remarkable Job in Achieving Desired Student Performance Objectives Has Relevance to the Job Market

This age-old dilemma in occupation education is not a problem that can be solved by comparing a computer printout of 10,000 performance objectives from one state with 12,000 performance objectives from another state.

What is needed is a level of generality that shows what is happening in developing:

- course level performance objectives,
- entry level job skills,
- and a system of tying them together.

This must be in terms of a manageable list of ten to twenty occupational block variables and not in terms of thousands of specific units.

An Example

Recently, it was possible to compare the blocks into which auto body repairs (USOE code, 17.0201) was subdivided by three states:

- two states which were trying to begin the coordination and mutual exchange of program objectives between various schools
- one state which developed these occupational blocks from the points of views of both teachers and employers.

Five Schools in Two States

Here are the occupational blocks and frequencies in a brief survey of auto body repairs in two states:

blocks	frequency
painting	3
parts assembly	2
panel assembly	2
frame	2
metal repair	1
fundamentals of metal	1
theory and application of welding	1
materials for body preparation preparation	1
hydraulics	1
estimating	1
glass	1
mechanical parts replacement	1
spray gun	1
used car conditioning	1
surfaces	1
chromes	1
rust and rot repair	1
delivery	1
paint types	1
paint problems	1
paint estimating	1

A rapid overview of this survey shows that it reflects many local issues:

- some schools work on a production basis where by students are taught to repair actual cars as they come in off the street
- not all of these schools agree on the level of complexity indicated by a block (e.g. all the items related to painting)
- some of the titles seem to stress physics (e.g. hydraulics) rather than auto body repair
- attitudes necessary for employment are nowhere obvious even though one could suppose that a trainee with a good disposition could learn quite a bit through on-the-job training

One State Comparing Teachers and Employers

This study was done on two levels, the block terminology level and the unit skill level.

Terminology Level

There was not too much difference between teachers and employers when it came to pinpointing the names of areas necessary for auto body repair occupational training in one state.

Here is a listing of the nine areas teachers and employers considered to be the main occupational blocks; eight of them were oriented towards skill and knowledge; the ninth was composed of thirteen desirable occupational attitudes.

Welding

Metal Straightening

Body and Frame Repair

Fiber Class Body Repair

Refinishing

Glass Replacement

Panel Replacement

Estimating

Thirteen Desirable Occupational Attitudes

Unit Skill Level

Once there was unanimity on the names of the necessary occupational blocks, it was found helpful to subdivide these down into specific units.

As long as the units rested on the name and terminology level, it was still possible to find a degree of unanimity.

Each group was asked to spell out two sorts of specifications:

- exactly what was to be performed by the objectives in each unit
- exactly how it was to be measured

The Apparent Differences

The findings of this survey seemed to indicate that:

- teachers seemed to place greater emphasis on the knowledge level of such things as welding than employers do
- employers seemed to require a higher level of skill in such things as refinishing than did teachers.
- employers were aware that a student with average or above-average intelligence can learn quite a bit through on-the-job training if he is willing to learn
- in many cases, willing to learn meant having the right attitude as defined by the employer

One interesting item, "The Right Attitude : Learning on-the-Job," will be developed in a separate section.

Implications of Such Research

With the assistance provided by an item and objective bank, a local educational agency will be able to see if it is doing a good job meeting the objectives chosen by its teachers. The LEA has then answered two questions:

- "What are we trying to do?"
- "How well have we done it?"

Once this first goal of self-accountability has been attained, it would be possible for the school to ask itself some more fundamental questions:

- "Are the objectives we have chosen really relevant to the demands of the job market?"
- "How well do our objectives square with the skill and ability patterns required in the market place?"

THE SYSTEM

Tying It All Together :

A Few Flowcharts Designed to Sketch out the Big Picture of Modules That Univy Educational Targets, Tests, and Technology

Introductory Comparison to CISNE

CISNE Flowchart

Training Teachers for Using the CISNE Concept

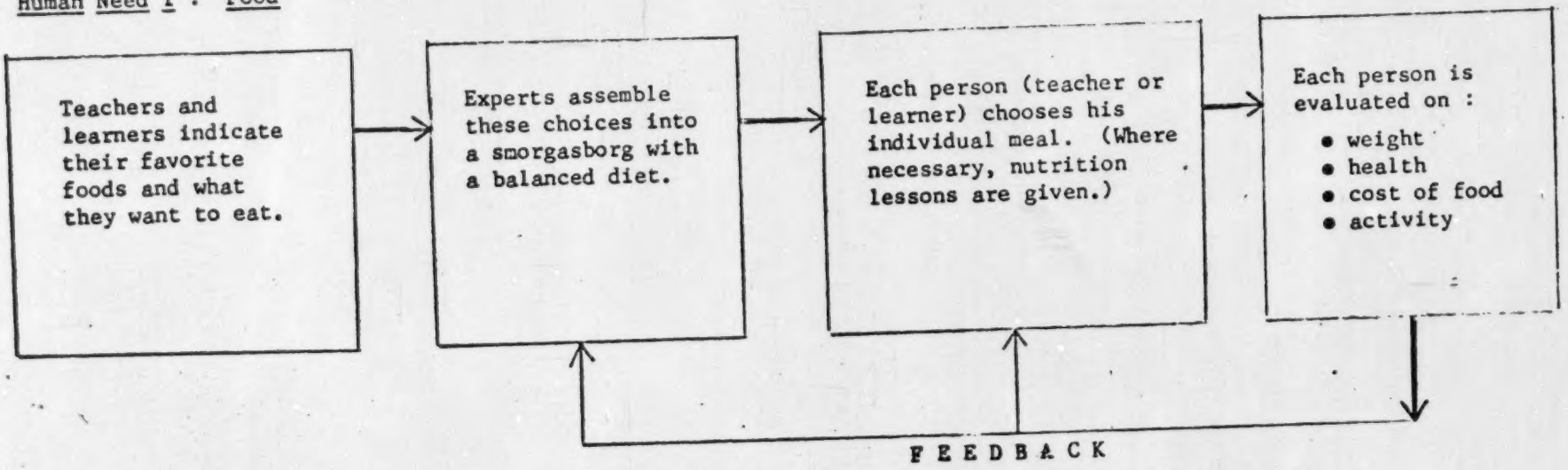
Training Teachers for Using the CISNE Product

Typical Module Components

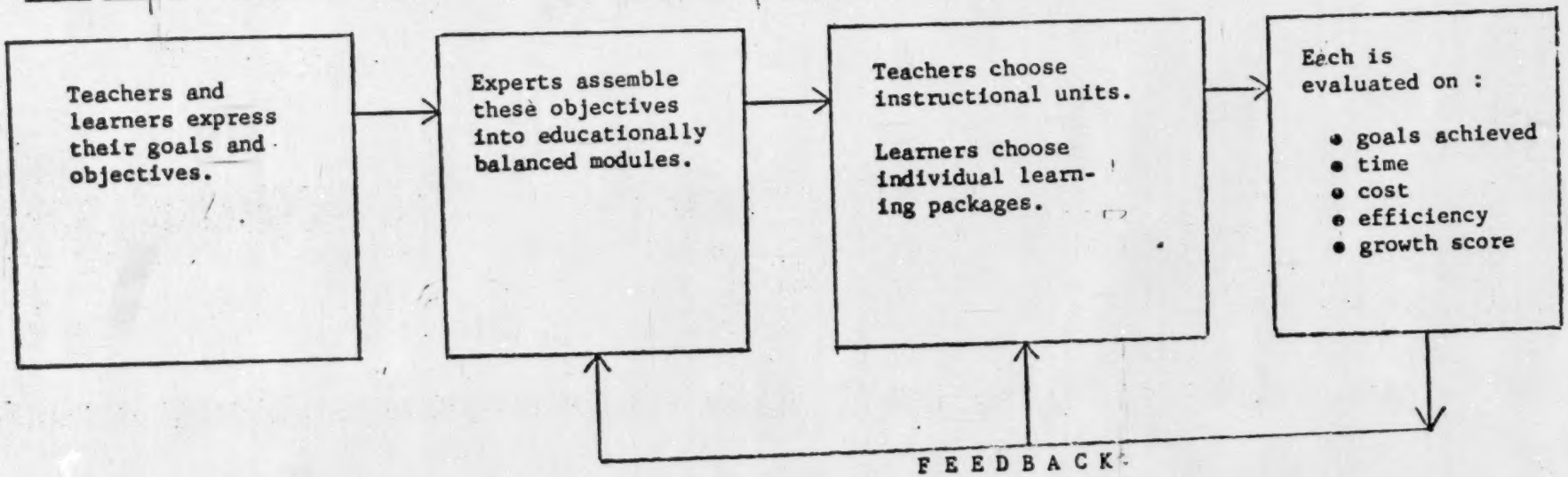
EVALUATION QUESTIONS
"What are we trying to do?"
"How well have we done it?"

INTRODUCTORY COMPARISON TO CISNE

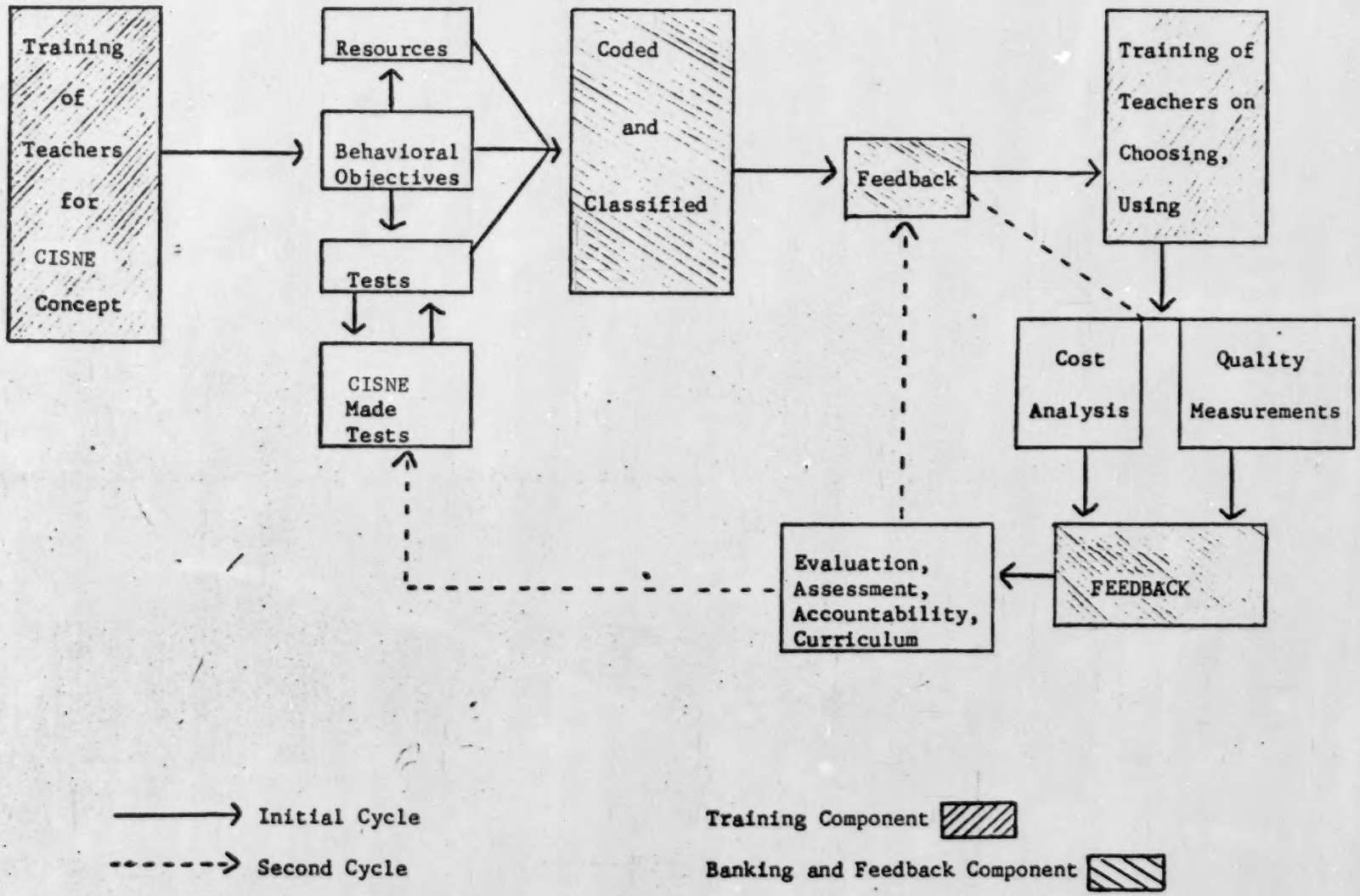
Human Need 1 : Food


Teachers and learners indicate their favorite foods and what they want to eat.
Experts assemble these choices into a smorgasborg with a balanced diet.
Each person (teacher or learner) chooses his individual meal. (Where necessary, nutrition lessons are given.)
Each person is evaluated on :
• weight
• health
• cost of food
• activity
FEEDBACK

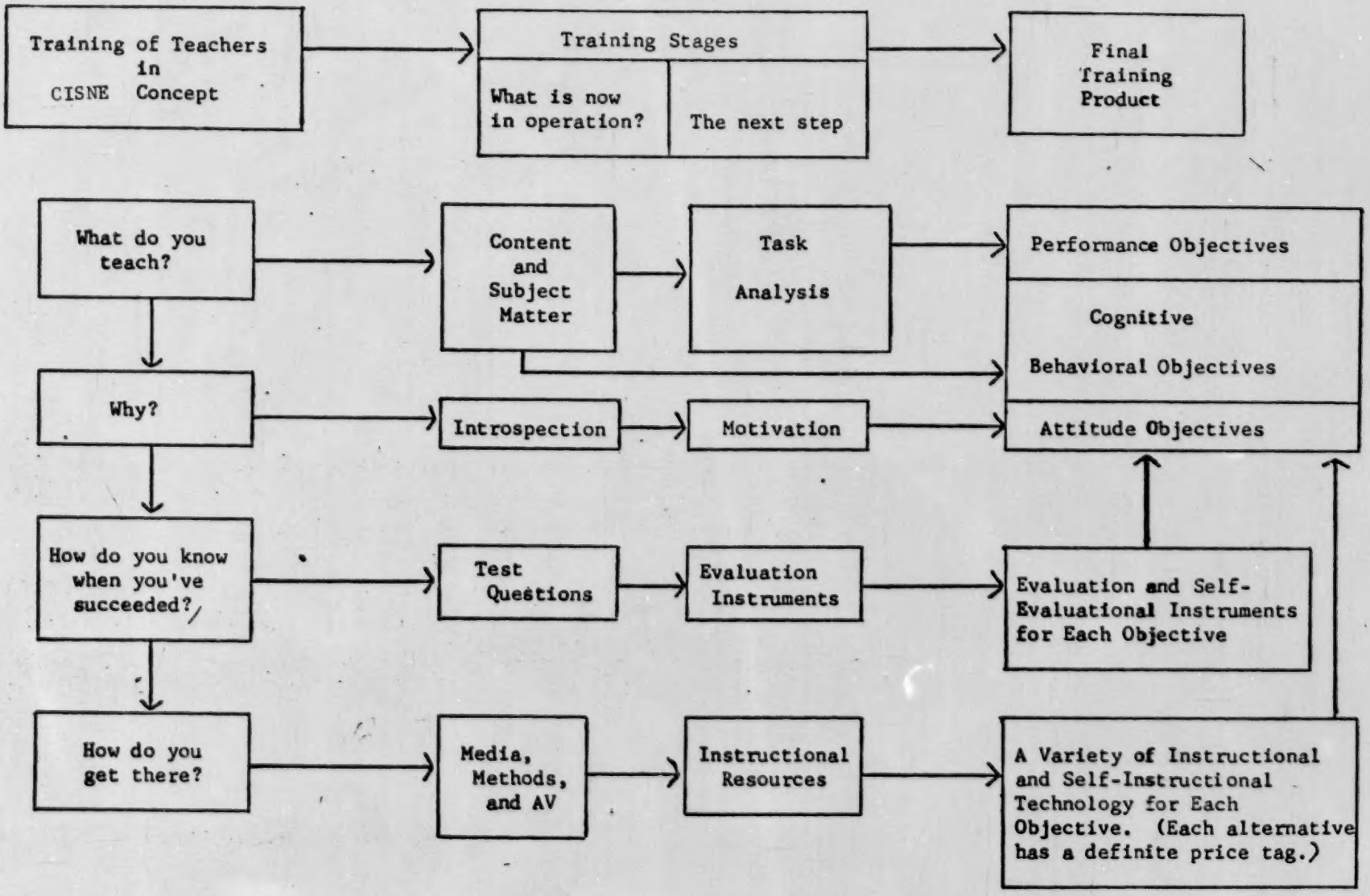
Human Need 2 : Learning Goals



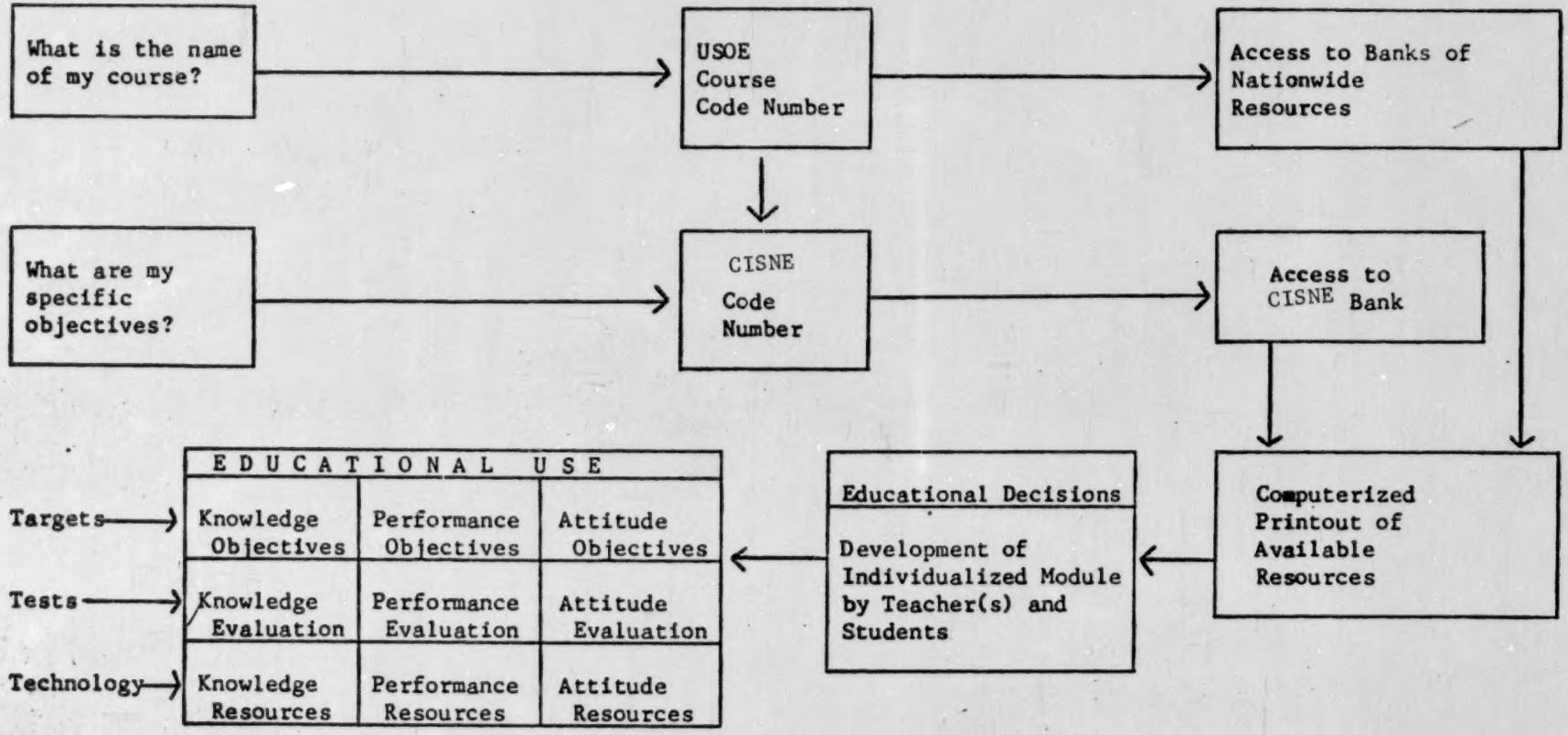
CISNE Flowchart



Training Teachers for Using the CISNE Concept



Training Teachers for Using the CISNE Product



TYPICAL MODULE COMPONENTS
(from which the teacher may choose)

0.1 - Knowledge Objectives (TARGETS) List of objectives Appropriate generalizations Vocabulary (active & passive) Significant names in field Correlated marketable skills Awareness of practical applications of related skills	0.4 - Performance Objectives (TARGETS) Ways to apply this knowledge Activities, projects, sample solutions, data to process People to interact with Things to do Checklist for teacher on typical local resources to seek out for student action	0.7 - Attitude Objectives (TARGETS) Attitude goals Motives to study Typical attitudes that lead to success on the job Hierarchy of needs and values Perspective of this module in long-range goals
0.2 - Knowledge Evaluation (TESTS) Pretest Diagnostic test Progress test (e.g. CAM) Posttest Charts, forms, formats for correcting, grading, evaluating, simplifying tests	0.5 - Performance Objectives (TESTS) Performance tests : pretest, progress test, posttest Orientation stressing the difference between knowledge and performance exams Stress on importance of making exam results visible	0.8 - Attitude Evaluation (TESTS) Attitude evaluators (pretest, progress test, posttest as distinct from personality test) Evaluation instruments for peer group attitude ratings Self-evaluative instruments Awareness of the difficulty to attain evaluation consensus
0.3 - Knowledge Resources (TECHNOLOGY) Texts to analyze in class Sample analyses AV sources Self-instructional materials Tables, charts, diagrams Texts to read	0.6 - Performance Resources (TECHNOLOGY) Examples of data correctly processed (forms, tools) Examples of how to interact with people (techniques) Examples of things to do Simulation situations, in-basket data, procedures	0.9 - Attitude Resources "How to" directions on role playing, brainstorming Typical ways to begin attitude exploration and development Sources of information on such components as attitude Case histories of what others have found to "work"